

CHAPTER II

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.' " M.P.E.P., § 601, 7th ed.

TRANSMITTAL LETTER  
TO THE UNITED STATES ELECTED OFFICE (EO/US)  
(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/SE00/01843	September 22, 2000	September 23, 1999
TITLE OF INVENTION		
METHOD, SYSTEM AND APPARATUS FOR REMOTE MEASURING OF ELECTRICAL POWER		
APPLICANT(S)		
Johan ASPLUND		

Box PCT

Assistant Commissioner for Patents

Washington D.C. 20231

ATTENTION: EO/US

**CERTIFICATION UNDER 37 C.F.R. §§ 1.8(a) and 1.10\***

(When using Express Mail, the Express Mail label number is mandatory;  
Express Mail certification is optional.)

I hereby certify that, on the date shown below, this correspondence is being:

MAILING

deposited with the United States Postal Service in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231  
37 C.F.R. § 1.8(a)  37 C.F.R. § 1.10 \*

with sufficient postage as first class mail.  as "Express Mail Post Office to Addressee"  
Mailing Label No. EV005526765US (mandatory)

TRANSMISSION

facsimile transmitted to the Patent and Trademark Office, (703) \_\_\_\_\_

Date: 3/20/02

  
Signature

Janet Gaffney

(type or print name of person certifying)

\* Only the date of filing (§ 1.6) will be the date used in a patent term adjustment calculation, although the date on any certificate of mailing or transmission under § 1.8 continues to be taken into account in determining timeliness. See § 1.703(f). Consider "Express Mail Post Office to Addressee" (§ 1.10) or facsimile transmission (§ 1.6(d)) for the reply to be accorded the earliest possible filing date for patent term adjustment calculations.

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**NOTE:** To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

**WARNING:** Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8.

**NOTE:** *Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).*

I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:

- a.  This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).
- b.  The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

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## 2. Fees

JC10 Rec'd PCT/PTO 2.0 MAR 2002

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
☒*	<b>TOTAL CLAIMS</b>	17 -20=	0	× \$18.00=	\$ -0-
	<b>INDEPENDENT CLAIMS</b>	3 -3=	0	× \$84.00=	-0-
	<b>MULTIPLE DEPENDENT CLAIM(S) (if applicable)</b>			+ \$280.00	
BASIC FEE**	<input type="checkbox"/> <b>U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY</b> Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: <input type="checkbox"/> and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) ..... \$100.00 <input type="checkbox"/> and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) ..... \$710.00 <input checked="" type="checkbox"/> <b>U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY</b> Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: <input type="checkbox"/> has been paid (37 C.F.R. § 1.492(a)(2)) ..... \$740.00 <input checked="" type="checkbox"/> has not been paid (37 C.F.R. § 1.492(a)(3)) ..... \$1040.00 <input type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) ..... \$890.00				
	<b>Total of above Calculations</b>	=\$1,040.00			
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Assertion must be made. (note 37 C.F.R. § 1.27)	-	520.00		
	<b>Subtotal</b>	520.00			
	<b>Total National Fee</b>	\$ 520.00			
	Fee for recording the enclosed assignment document \$40.00 (37 C.F.R. § 1.21(h)). (See item 13 below). See attached "ASSIGNMENT COVER SHEET".	n/a			
<b>TOTAL</b>	<b>Total Fees enclosed</b>	\$ 520.00			

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 3 of 9)

\*See attached Preliminary Amendment Reducing the Number of Claims.

Attached is a  check  money order in the amount of \$ 520.00

Authorization is hereby made to charge the amount of \$ \_\_\_\_\_

to Deposit Account No. \_\_\_\_\_

to Credit card as shown on the attached credit card information authorization form PTO-2038.

**WARNING:** Credit card information should not be included on this form as it may become public.

Charge any additional fees required by this paper or credit any overpayment in the manner authorized above.

A duplicate of this paper is attached.

**WARNING:** "To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: \*\*\* (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).

**WARNING:** If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.

Assertion of Small Entity Status

Applicant hereby asserts status as a small entity under 37 C.F.R. § 1.27.

**NOTE:** 37 C.F.R. § 1.27(c) deals with the assertion of small entity status, whether by a written specific declaration thereof or by payment as a small entity of the basic filing fee or the fee for the entry into the national phase as states:

"(c) Assertion of small entity status. Any party (person, small business concern or nonprofit organization) should make a determination, pursuant to paragraph (f) of this section, of entitlement to be accorded small entity status based on the definitions set forth in paragraph (a) of this section, and must, in order to establish small entity status for the purpose of paying small entity fees, actually make an assertion of entitlement to small entity status, in the manner set forth in paragraphs (c)(1) or (c)(3) of this section, in the application or patent in which such small entity fees are to be paid.

(1) Assertion by writing. Small entity status may be established by a written assertion of entitlement to small entity status. A written assertion must:

(i) Be clearly identifiable;  
(ii) Be signed (see paragraph (c)(2) of this section); and

(iii) Convey the concept of entitlement to small entity status, such as by stating that applicant is a small entity, or that small entity status is entitled to be asserted for the application or patent. While no specific words or wording are required to assert small entity status, the intent to assert small entity status must be clearly indicated in order to comply with the assertion requirement.

(2) Parties who can sign and file the written assertion. The written assertion can be signed by:

(i) One of the parties identified in §§ 1.33(b) (e.g., an attorney or agent registered with the Office), §§ 3.73(b) of this chapter notwithstanding, who can also file the written assertion;  
(ii) At least one of the individuals identified as an inventor (even though a §§ 1.63 executed oath or declaration has not been submitted), notwithstanding §§ 1.33(b)(4), who can also file the written assertion pursuant to the exception under §§ 1.33(b) of this part; or  
(iii) An assignee of an undivided part interest, notwithstanding §§ 1.33(b)(3) and 3.73(b) of this chapter, but the partial assignee cannot file the assertion without resort to a party identified under §§ 1.33(b) of this part.

(3) Assertion by payment of the small entity basic filing or basic national fee. The payment, by any party, of the exact amount of one of the small entity basic filing fees set forth in §§ 1.16(a), (f), (g), (h), or (k), or one of the small entity basic national fees set forth in §§ 1.492(a)(1), (a)(2), (a)(3), (a)(4), or (a)(5), will be treated as a written assertion of entitlement to small entity status even if the type of basic filing or basic national fee is inadvertently selected in error.

(i) If the Office accords small entity status based on payment of a small entity basic filing or basic national fee under paragraph (c)(3) of this section that is not applicable to that application, any balance of the small entity fee that is applicable to that application will be due along with the appropriate surcharge set forth in §§ 1.16(e), or §§ 1.16(l).

(ii) The payment of any small entity fee other than those set forth in paragraph (c)(3) of this section (whether in the exact fee amount or not) will not be treated as a written assertion of entitlement to small entity status and will not be sufficient to establish small entity status in an application or a patent."

3.  A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

NOTE: Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.

- a.  is transmitted herewith.
- b.  is not required, as the application was filed with the United States Receiving Office.
- c.  has been transmitted
  - i.  by the International Bureau.

Date of mailing of the application (from form PCT/1B/308):  
March 29, 2001

- ii.  by applicant on \_\_\_\_\_. (Date)

4.  A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):

- a.  is transmitted herewith.
- b.  is not required as the application was filed in English.
- c.  was previously transmitted by applicant on \_\_\_\_\_. (Date)
- d.  will follow.

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 5 of 9)

10/088810  
JC10 Rec'd PCT/PTO 20 MAR 2002

5.  Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: *The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected."* 1147 O.G. 29-40, at 36.

- a.  are transmitted herewith.
- b.  have been transmitted
  - i.  by the International Bureau.

Date of mailing of the amendment (from form PCT/1B/308):  
\_\_\_\_\_

- ii.  by applicant on \_\_\_\_\_. (Date)
- c.  have not been transmitted as
  - i.  applicant chose not to make amendments under PCT Article 19.

Date of mailing of Search Report (from form PCT/ISA/210.):  
\_\_\_\_\_

- ii.  the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6.  A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):

- a.  is transmitted herewith.
- b.  is not required as the amendments were made in the English language.
- c.  has not been transmitted for reasons indicated at point 5(c) above.

7.  A copy of the international examination report (PCT/IPEA/409)

- is transmitted herewith.
- is not required as the application was filed with the United States Receiving Office.

8.  Annex(es) to the international preliminary examination report

- a.  is/are transmitted herewith.
- b.  is/are not required as the application was filed with the United States Receiving Office.

9.  A translation of the annexes to the international preliminary examination report

- a.  is transmitted herewith.
- b.  is not required as the annexes are in the English language.

(Transmittal Letter to the United States Elected Office (EO/US) [13-18]—page 6 of 9)

10.  An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115

- was previously submitted by applicant on \_\_\_\_\_. (Date)
- is submitted herewith, and such oath or declaration
  - is attached to the application.
  - identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.
- will follow.

II. Other document(s) or information included:

11.  An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):

- is transmitted herewith.
- has been transmitted by the International Bureau.  
Date of mailing (from form PCT/IB/308): March 29, 2001
- is not required, as the application was searched by the United States International Searching Authority.
- will be transmitted promptly upon request.
- has been submitted by applicant on \_\_\_\_\_. (Date)

12.  An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:

- is transmitted herewith.

Also transmitted herewith is/are:

Form PTO-1449 (PTO/SB/08A and 08B).

Copies of citations listed.

b.  will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).

c.  was previously submitted by applicant on \_\_\_\_\_. (Date)

13.  An assignment document is transmitted herewith for recording.

A separate  "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or  FORM PTO 1595 is also attached.

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JC10 Rec'd PCT/PTO 20 MAR 2002

14.  Additional documents:

- a.  Copy of request (PCT/RO/101)
- b.  International Publication No. WO 01/22102 A1
  - i.  Specification, claims and drawing
  - ii.  Front page only
- c.  Preliminary amendment (37 C.F.R. § 1.121)
- d.  Other

Submission of Proposed Drawing Amendment w/2 drawing  
sheets

15.  The above checked items are being transmitted

- a.  before 30 months from any claimed priority date.
- b.  after 30 months.

16.  Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on \_\_\_\_\_, namely:

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**AUTHORIZATION TO CHARGE ADDITIONAL FEES**

**WARNING:** *Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.*

**NOTE:** *"A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).*

**NOTE:** *"Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).*

Please charge, ~~in the manner authorized above~~, the following additional fees that may be required by this paper and during the entire pendency of this application:

37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

**WARNING:** *Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.*

JC10 Rec'd PCT/PTO 2.0 MAR 2002

 37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid for these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

 37 C.F.R. § 1.17 (application processing fees) 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)). 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).

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SIGNATURE OF PRACTITIONER

K. Bradford Adolphson

Ware, Fressola, Van der Sluys &amp; Adolphson LLP

(type or print name of practitioner)

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Bradford Green, Bldg. 5, 755 Main Street

P.O. Address

---

P.O. Box 224, Monroe, CT 06468

Reg. No.: 30,927

Tel. No.: (203) 261-1234

Customer No.: 004955

Practitioner's Docket No. 543-001-2

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Asplund  
 Application No.: 0 / Group No.:  
 Filed: herewith Examiner:  
 For: METHOD, SYSTEM AND APPARATUS FOR REMOTE  
 MEASURING OF ELECTRICAL POWER

Assistant Commissioner for Patents  
 Washington, D.C. 20231

SUBMISSION OF PROPOSED DRAWING AMENDMENT  
FOR APPROVAL BY EXAMINER (37 C.F.R. 1.123)

Attached please find

(check applicable items)

a sketch in permanent ink,  
 a copy of the original drawing(s) with red ink markings,

showing the proposed changes to the drawing(s) in this application, for which the approval of the Examiner is requested.



## SIGNATURE OF PRACTITIONER

K. Bradford Adolphson

Ware, Fressola, Van der Sluys & Adolphson LLP  
(type or print name of practitioner)

Reg. No.: 30,927

Bradford Green, Bldg. 5, 755 Main Street  
P.O. Address

Tel. No.: (203) 261-1234

P.O. Box 224, Monroe, CT 06468

Customer No.: 004955

NOTE: 37 C.F.R. § 1.121(a)(3)(ii) indicates that "Where a change to the drawings is desired, a sketch in permanent ink showing proposed changes in red, to become part of the record, must be filed for approval by the examiner and should be in a separate paper."

NOTE: While drawings submitted under §§ 1.81, 1.83-1.85, 1.152, 1.165, 1.174, and 1.437 may not be filed by facsimile, proposed drawing corrections for approval may be submitted by facsimile transmission. Notice of Oct. 15, 1993, 58 Fed. Reg. 54,494-54,504, at 54,495.

## CERTIFICATE OF MAILING/TRANSMISSION (37 C.F.R. 1.8(a))

I hereby certify that this correspondence is, on the date shown below, being:

## MAILING

deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

## FACSIMILE

transmitted by facsimile to the Patent and Trademark Office.

Signature

Date: \_\_\_\_\_

(type or print name of person certifying)

(Submission of Proposed Drawing Amendment for Approval by Examiner (37 C.F.R. 1.123) [9-16]—page 1 of 1)

Express Mail No. EV005526765US

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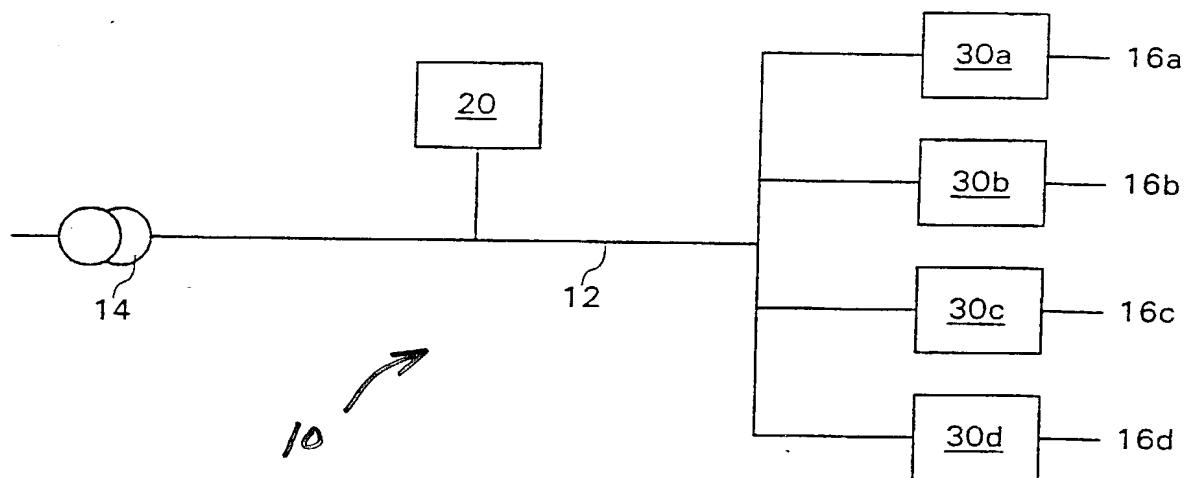
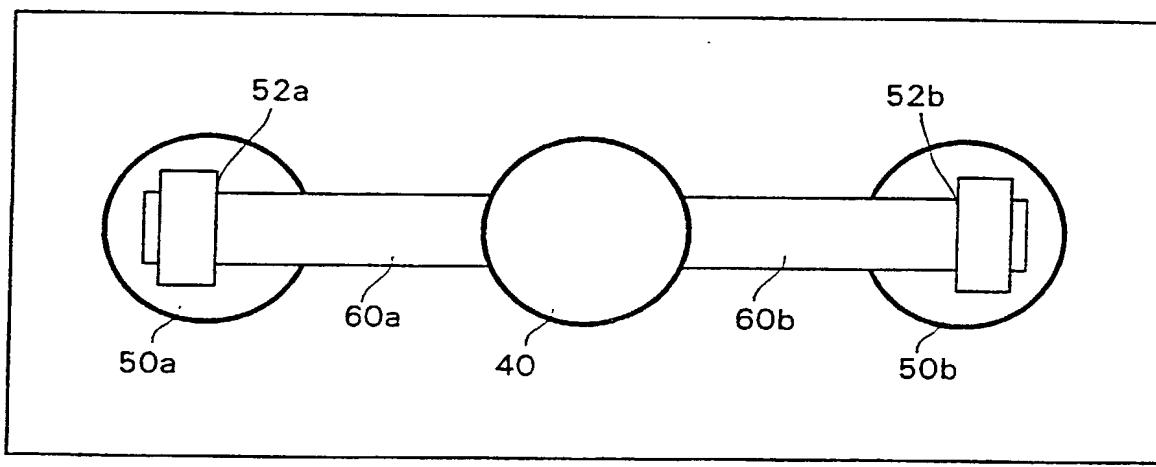


Fig. 1



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Fig. 2

10/088810

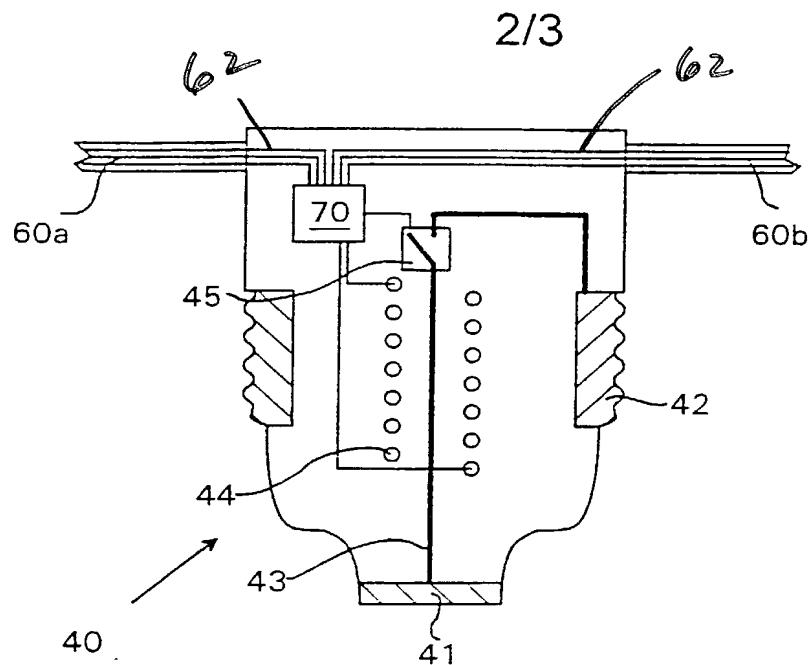


Fig. 3a

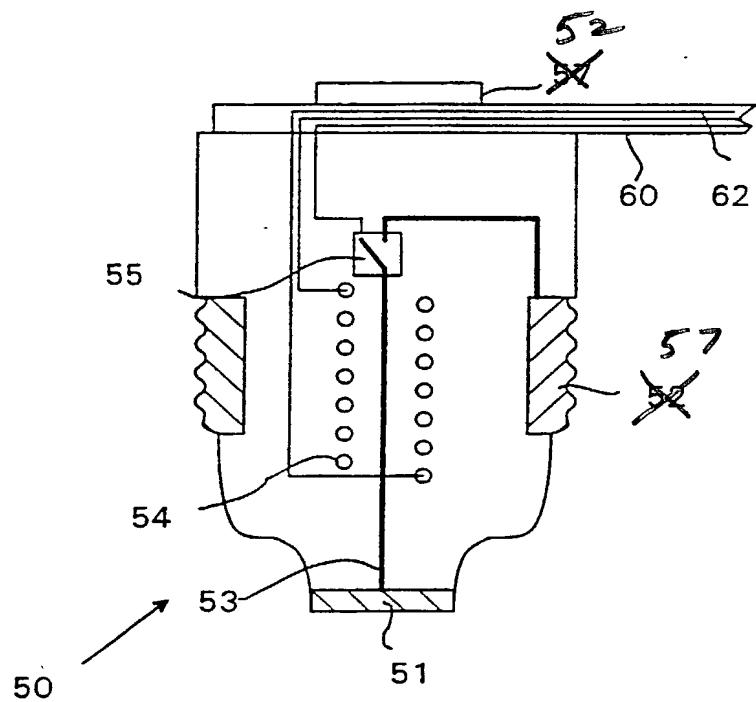


Fig. 3b

Practitioner's Docket No. 543-001-2JC10 Rec'd PCT/PTO 20 MAR 2002  
**PATENT****IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of: Johan Asplund

For: METHOD, SYSTEM AND APPARATUS FOR REMOTE MEASURING  
OF ELECTRICAL POWER

the specification of which is attached hereto.

Assistant Commissioner for Patents  
Washington, D.C. 20231**AMENDMENT ACCOMPANYING NEW APPLICATION TRANSMITTAL****CERTIFICATION UNDER 37 C.F.R. 1.10\****(Express Mail label number is mandatory.)**(Express Mail certification is optional.)*

I hereby certify that this paper is being deposited with the United States Postal Service on this date  
March 20, 2002, in an envelope as "Express Mail Post Office to Addressee," Mailing Label  
Number EV005526765US addressed to the: Assistant Commissioner for Patents, Washington,  
D.C. 20231.

Janet Gaffney

(type or print name of person mailing paper)

Janet Gaffney

Signature of person mailing paper

**WARNING:** Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

**WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. 1.10(b).

"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will not be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

(Amendment Accompanying New Application Transmittal [4-4])

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10/088810  
JC10 Rec'd PCT/PTO 20 MAR 2002  
PATENT  
Attorney Docket No.  
543-001-2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the matter of: Johan Asplund  
Serial No.: To be assigned  
Filed: herewith  
For: METHOD, SYSTEM AND APPARATUS FOR REMOTE  
MEASURING OF ELECTRICAL POWER

Box PCT  
Assistant Commissioner for Patents  
Washington, DC 20231  
ATTN: EO/US

AMENDMENT ACCOMPANYING NEW APPLICATION

Sir:

Please amend the accompanying application as follows:

In the specification:

Replace the paragraph beginning at page 1, line 11, with the following rewritten paragraph:

-- BACKGROUND

In the field of electrical power measurement, many kinds of electrical power meters are known. However, prior art apparatus have been dimensioned with regard to electromechanical measuring devices. This has led to bulky devices, which are difficult to install. --

Express Mail No. EV005526765US

Replace the paragraph beginning at page 3, line 1 with the following rewritten paragraph:

-- SUMMARY OF THE INVENTION

The invention is based on the realization that the electromagnetic field around an electric conductor can be used to measure the power flowing through the conductor by means of sensors without any movable parts and to drive an electronic circuit. This is used together with digital communication through the electric conductor to provide for remote measuring and control of the electrical power consumed by a consumer connected to an electric power network. --

On page 3, delete the second, third and fourth paragraphs (lines 11-17).

Replace the paragraph beginning at page 4, line 8 with the following rewritten paragraph:

-- Figs. 3a and 3b are cross-sectional views of a master and a slave module, respectively, to be incorporated in electrical power meter shown in figure 2, and ---.

Replace the paragraph beginning at page 5, line 5 with the following rewritten paragraph:

-- At each consumer there is provided a respective electrical power meter 30a-d, an overview of which will now be given with reference to figure 2. The three-phase meter is made up of three parts shaped and configured as conventional fuses or circuit breakers. The three parts comprise two identical slave modules 50a, 50b connected to a master module 40. The three modules are arranged to be mounted as conventional plug fuses in a fuse box with the master module 40 arranged in the center position and the slave modules 50a, 50b arranged on either side thereof. The slave modules are connected to the master module by means of a respective strip 60a, 60b made of polyester or another fragile or brittle material. The reason for this choice of material is that it should be difficult to remove the strip once it is installed, thereby preventing fraudulent manipulation of the arrangement. --

Replace the paragraph beginning at page 5, line 22 with the following rewritten paragraph:

-- The strip 60 is permanently attached to the master module 40 and electrically connected thereto by means of a pattern (not shown) of three rather wide printed copper paths 62 running in parallel between the master module 40 and the slave module 50 when connected thereto. The procedure of connecting the slave modules to the master module follows the following steps. First, the master module 40 and the slave modules 50a, 50b are screwed

into a respective socket with the master module 40 positioned between the slave modules 50a, 50b. Special care must be taken to ensure that the strips 60a, 60b are not damaged during this process. The strips 60a, 60b are then inserted into a respective slot 52a, 52b arranged in the slave modules. Once inserted into the slots 52, the strips 60 cannot be withdrawn from the slave modules because of a one-way retaining means provided in the slot. --

Replace the paragraph beginning at page 6, line 7 with the following rewritten paragraph:

-- With the strips 60 attached, it is not possible to unscrew the modules 40, 50 because the strips 60 would then break, destroying the arrangement by breaking the electrical connection between the master module and the slave modules. --

Replace the paragraph beginning at page 6, line 15 with the following rewritten paragraph:

-- The structure of the master module 40 will now be described with reference to figure 3a, which shows a cross-section through the center of the master module. The module has a general outline similar to a conventional fuse, with a bottom connector 41 adapted for connection to the bottom surface of the fuse socket (not shown) and thus functioning as a

first connector of the module. The bottom connector 41 is electrically connected to a thread 42 by means of a conductive wire 43. The thread is shaped so as to fit with the internal thread (not shown) provided in the fuse socket and thus functions as a second connector of the module. A major portion of the conductive wire 43 runs essentially parallel to the longitudinal axis of the fuse 40. --

Replace the paragraph beginning at page 7, line 28 with the following rewritten paragraph:

-- All components included in the modules 40 and 50 are preferably embedded in a mold made of a suitable polymer. --

Replace the paragraph beginning at page 8, line 1 with the following rewritten paragraph:

-- In figure 3b, a slave module 50 is shown in cross-section. The slave module is similar to the master module with the exception of the electronic circuitry 70, which is omitted in the slave modules. Thus, a slave module comprises a first connector 51, a second connector 57, a conductive wire 53 there between, a coil 54 and a trip circuit 55. The coil 54 and the trip circuit 55 are connected to a contact means 56 arranged to connect to the conductive paths 62 of a strip 60 inserted into the above mentioned slot 52 of the slave module 50. In that way,

both the coil 54 and the trip circuit 55 of a slave module are connected to the electronic circuitry 70 of the master module 40. --

Replace the paragraph beginning at page 8, line 14 with the following rewritten paragraph:

-- The electronic circuitry 70 of the master module 40 will now be described, partly with reference to figure 4, which is a schematic block diagram of the electronic function of the master-slave arrangement shown in figure 2. The main part of the circuitry 70 is a processor 72. This is preferably a low voltage version of the type 8751 processor, operating at 2.7 Volts or lower, and provided with an internal EEPROM. The low power consumption of this device, less than 150 mamps, makes this circuit ideal for this kind of application. --

Replace the paragraph beginning at page 8, line 29 with the following rewritten paragraph:

-- Filters 78 functioning as stabilizers are also provided between the coil 44 and processor 72. --

Replace the paragraph beginning at page 11, line 26 with the following rewritten paragraph:

-- It is also possible to calibrate the master module 40 by means of a predetermined FSK pattern superposed on the normal current of the wires 12. As an example, a signal comprising solely "1":s is transmitted from the server 20. This signal represents a certain current level, which is then detected and interpreted by the master module 40. By means of this detected current shift, the module 40 can then be self-calibrated. Thus, a signal having a predetermined level is input and the output level is determined. The module then calibrates until the output level is equal to the input level. With the described system, billing of the customers is effected in the following way. The server 20 collects and compiles the odometer readings from the meters 30. A software application then connects a number of measurements from a certain device to a predefined tariff and adds information of the account customer 16. This gives the full information to create a record and, hence, a bill to be sent to the customer in any convenient way, such as through the Internet or by ordinary mail. --

Replace the paragraph beginning at page 13, line 3 with the following rewritten paragraph:

-- A preferred embodiment of the invention has been described. However, the person skilled in the art realizes that this can be varied within the scope of the appended claims without departing from the inventive idea. Thus, an electrical

three-phase system has been shown. It is realized that the invention is applicable to single phase systems as well, in which case the slave modules are omitted. --

In the claims:

On page 15, line 1, change "CLAIMS" to -- What is claimed is: --.

Cancel all existing claims and add the following new claims:

17. (New) A method of measuring electrical power conducted through at least one electrical conductor, comprising the following steps:

- sensing an electromagnetic field around said at least one electrical conductor at a measuring position,
- deriving current flowing through said at least one electrical conductor from said sensed electromagnetic field,
- storing instantaneous values for said current in an electronic memory means powered by said electromagnetic field, and

- transmitting digital information on said at least one electrical conductor to a transceiver provided at a distance from said measuring position, said digital information being representative of said instantaneous values.

18. (New) A method according to claim 17, wherein said transmitting is effected by means of frequency shift keying.

19. (New) A method according to claim 17, wherein said sensing is effected by means of an electrically conductive coil arranged around said at least one electrical conductor.

20. (New) An electrical power meter connectable to at least one electrical conductor, said power meter comprising:

- means for sensing an electromagnetic field around said at least one electrical conductor,
- means for deriving current flowing through said at least one electrical conductor from said sensed electromagnetic field,
- means for storing instantaneous values for said current, wherein said means for storing are powered by said electromagnetic field, and

- means for transmitting digital information on said at least one electrical conductor to a transceiver provided at a distance from said measuring position, said digital information being representative of said instantaneous values.

21. (New) A meter according to claim 20, comprising:

- at least one first connector connectable to said at least one electrical conductor,
- at least one second connector connectable to an electric load, and
- a switch arranged to interconnect said at least one first and second connectors in normal operation and, when commanded, to disconnect said at least one first connector from said at least one second connector.

22. (New) A meter according to claim 21, wherein said switch means is commanded by a processor.

23. (New) A meter according to claim 22, wherein said processor is commanded by said transceiver via said at least one electrical conductor.

24. (New) A meter according to claim 20, comprising at least one module arranged to be installed as a fuse.

25. (New) A meter according to claim 20, wherein said meter is arranged for measuring three-phase power, comprising:

- a first module including:
  - a first connector connectable to said at least one electrical conductor, and
  - a second connector connectable to an electric load and to said first connector, and
- two second modules, each of said second modules including:
  - a first connector connectable to said at least one electrical conductor, and
  - a second connector connectable to an electric load and to said first connector,
- wherein each of said second modules is electrically connectable to said first module by interconnecting means arranged to be permanently attached to said first and second modules.

26. (New) A meter according to claim 25, wherein said interconnecting means comprises a strip made of fragile material, said strip having a layer of electrically conducting paths thereon.

27. (New) A meter according to claim 26, wherein said fragile material is polyester.

28. (New) A meter according to claim 25, wherein said interconnecting means are inserted into slots when permanently attached.

29. (New) A meter according to claim 20, wherein said means for transmitting digital information comprises:

- a processor, and
- a coil arranged around said at least one electrical conductor, the ends of said coil being connected to said processor,
- wherein an electric current commanded by said processor is induced in said coil, resulting in a corresponding induced current in said electrical conductor, by which induced current digital information is transferred via said electrical conductor.

30. (New) A meter according to claim 29, wherein the number of turns of said coil is about 500.

31. (New) A meter according to claim 20, wherein said digital information is transmitted by means of frequency shift keying.

32. (New) A meter according to claim 20, wherein the current flowing through said at least one electrical conductor is measured at a rate of 1000 samples per second.

33. (New) A system for measuring electrical power, comprising:

(a) an electrical power network,

(b) a computer connected to said power network, and

(c) an electrical power meter connected to said electrical power network, said electrical power network comprising:

- means for sensing an electromagnetic field around said at least one electrical conductor,

- means for deriving current flowing through said at least one electrical conductor from said sensed electromagnetic field,
- means for storing instantaneous values for said current, wherein said means for storing are powered by said electromagnetic field, and
- means for transmitting digital information on said at least one electrical conductor to a transceiver provided at a distance from said measuring position, said digital information being representative of said instantaneous values.

Abstract:

Delete any existing abstract and insert the following after the claims:

**-- ABSTRACT OF THE DISCLOSURE**

In a method, system and apparatus of measuring electrical power to consumers (16a-d) in a power distribution network (12), an electromagnetic field is sensed around at least one electrical conductor (12) in a power meter (30a-d) located at a consumer. The current flowing through the conductor is then derived from

the sensed electromagnetic field. Instantaneous current values are stored in an electronic memory powered by the electromagnetic field. These instantaneous values or values derived from the instantaneous values are transmitted as digital information on the network to a receiver (20) provided at a distance from the power meter. --

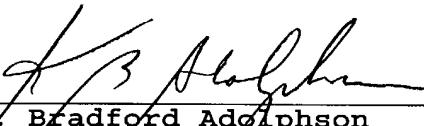
REMARKS

This preliminary amendment makes changes to the specification, claims and abstract of the above-referenced patent application to place the application in better form for examination.

Respectfully submitted,

Dated: 3/20/2002

By

  
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

On page 1, the paragraph beginning at line 11 has been changed as follows:

-- BACKGROUND

[It is] In the field of electrical power measurement, many kinds of electrical power meters are known. However, prior art [apparatuses] apparatus have been dimensioned with regard to electromechanical measuring devices. This has [lead] led to bulky devices, which are difficult to install. --

On page 3, in line 2, the spelling of "realization" has been corrected.

On page 3, the second, third and fourth paragraphs have been deleted (lines 11-17).

On page 3, in line 19, the spelling of "organization" has been corrected.

On page 4, the paragraph beginning at line 8 has been changed as follows:

-- Figs. 3a and 3b are cross-sectional views of a master and a slave module, respectively, to be incorporated in electrical power meter shown in figure 2, and --.

On page 5, the paragraph beginning at line 5 has been changed as follows:

-- At each consumer there is provided a respective electrical power meter 30a-d, an overview of which will now be given with reference to figure 2. The three-phase meter is made up of three parts shaped and configured as conventional fuses or circuit breakers. The three parts comprise two identical slave modules 50a, 50b connected to a master module 40. The [tree] three modules are arranged to be mounted as conventional plug fuses in a fuse box with the master module 40 arranged in the [centre] center position and the slave modules 50a, 50b arranged on either side thereof. The slave modules are connected to the master module by means of a respective strip 60a, 60b made of polyester or another fragile or brittle material. The reason for this choice of material is that it should be difficult to remove the strip once it is installed, thereby preventing fraudulent manipulation of the arrangement. --

On page 5, the paragraph beginning at line 22 has been changed as follows:

-- The strip 60 is permanently attached to the master module 40 and electrically connected thereto by means of a pattern (not shown) of three rather wide printed copper paths 62[a-c] running in parallel between the master module 40 and the slave module 50 when connected thereto. The procedure of connecting the slave modules to the master module follows the following steps. First, the master module 40 and the slave modules 50a, 50b are screwed into a respective socket with the master module 40 positioned between the slave modules 50a, 50b. Special care must be taken to ensure that the strips 60a, 60b are not damaged during this process. The strips 60a, 60b are then inserted into a respective slot 52a, 52b arranged in the slave modules. Once inserted into the slots 52, the strips 60 [can] [not] cannot be withdrawn from the slave modules because of a one-way retaining means provided in the slot. --

On page 6, the paragraph beginning at line 7 has been changed as follows:

-- With the strips 60 attached, it is not possible to unscrew the modules 40, 50 because the [stripes] strips 60 would then break, destroying the arrangement by breaking the electrical connection between the master module and the slave modules. --

On page 6, line 17, the spelling of "center" has been corrected.

On page 7, line 29, the spelling of "mold" has been corrected.

On page 8, the paragraph beginning at line 1 has been changed as follows:

-- In figure 3b, a slave module 50 is shown in cross-section. The slave module is similar to the master module with the exception of the electronic circuitry 70, which is omitted in the slave modules. Thus, a slave module comprises a first connector 51, a second connector [52] 57, a conductive wire 53 there between, a coil 54 and a trip circuit 55. The coil 54 and the trip circuit 55 are connected to a contact means 56 arranged to connect to the conductive paths 62 of a strip 60 inserted into the above mentioned slot [57] 52 of the slave module 50. In that way, both the coil 54 and the trip circuit 55 of a slave module are connected to the electronic circuitry 70 of the master module 40. --

On page 8, the paragraph beginning at line 14 has been changed as follows:

-- The electronic circuitry 70 of the master module 40 will now be described, partly with reference to figure 4, which is a schematic block diagram of the electronic function of the master-slave arrangement shown in figure 2. The main part of the circuitry 70 is a processor 72. This is preferably a low voltage

version of the type 8751 processor, operating at [2,7] 2.7 Volts or lower, and provided with an internal EEPROM. The low power consumption of this device, less than 150 mamps, makes this circuit ideal for this kind of application. --

On page 8, in line 29, the spelling of "stabilizers" has been corrected.

On page 11, the paragraph beginning at line 26 has been changed as follows:

-- It is also possible to calibrate the master module 40 by means of a predetermined FSK pattern superposed on the normal current of the wires 12. As an example, a signal comprising solely "1":s is transmitted from the server 20. This signal represents a certain current level, which is then detected and interpreted by the master module 40. By means of this detected current shift, the module 40 can then be self-calibrated. Thus, a signal having a predetermined level is input and the output level is determined. The module then calibrates until the output level is equal to the input level. With the described system, billing of the customers is effected in the following way. The server 20 collects and compiles the odometer readings from the meters 30. A software application then connects a number of measurements from a certain [devices] device to a predefined tariff and adds information of the account customer 16. This

gives the full information to create a record and, hence, a bill to be sent to the customer in any convenient way, such [a] as through the Internet or by ordinary mail. --

On page 13, in line 5, the spelling of "realizes" has been corrected; and in line 8, the spelling of "realized" has been corrected.

In the Claims:

On page 15, line 1 "CLAIMS" has been changed to -- What is claimed is: --.

Claims 1-16 have been cancelled.

New claims 17-33 have been added.

Abstract:

The abstract has been changed as follows:

-- [Abstract:] ABSTRACT OF THE DISCLOSURE

[A] In a method, system and apparatus of measuring electrical power to consumers (16a-d) in a power distribution network (12) [is described. The method comprises sensing an] an electromagnetic field is sensed around at least one electrical conductor (12) in a power meter (30a-d) located at a consumer.

The current flowing through the conductor is then derived from [said] the sensed electromagnetic field. Instantaneous current values are stored in an electronic memory powered by [said] the electromagnetic field. These instantaneous values or values derived from the instantaneous values are transmitted as digital information on the network to a receiver (20) provided at a distance from the power meter. --

Method, system and apparatus for remote measuring of electrical power.

FIELD OF INVENTION

5 The present invention relates generally to a method, a system and an apparatus for measurement of electrical power and more specifically to a method, a system and an apparatus wherein electrical power meters connected to an electrical distribution network are remotely controlled by a remote server.

BACKGROUND

15 It is field of electrical power measurement many kinds of electrical power meters are known. However, prior art apparatuses have been dimensioned with regard to electromechanical measuring devices. This has lead to bulky devices, which are difficult to install.

20 The UK patent document GB-2 321 305 discloses a remote meter reading apparatus provided for retrofitting to an existing meter. This reading apparatus relies on an already installed meter having a Ferraris disc. The apparatus is provided with a wireless transmitter for transmitting data derived from a sensor to a remote location. However, this solution provides for a bulky device limited to its application in existing networks.

25 An electronic meter for measuring electrical power fed from an electrical power distribution network to an electrical power consumer itself requires electrical power in order to function. A convenient way of providing this power is to furnish the electronic meter with 30 means for drawing electrical power from the power network used to supply the consumer. However, the current

which an electronic meter is permitted to draw from an electrical power distribution network is limited by statutory regulation.

The UK patent document GB-2 301 903 discloses an electrical power supply meter provided with an opto-transmitter arranged for communicating data appertaining to a meter reading and at the same time not to disturb the power network connected to the meter.

Trip units for tripping an electronic circuit are known for example through the European patent document EP 0 949 734 A2. In the device disclosed therein processors are arranged to trip an electric circuit on detection of a fault condition. However, there are other instances where tripping of an electric circuit is desired.

#### OBJECTS OF THE INVENTION

An object of the present invention is to provide an electrical power consumption measuring system wherein electrical power meters are remotely read and controlled in an efficient way.

Another object is to provide an electrical power meter, which is inexpensive, easy to install and is adapted for communication through the electrical power network to which it is connected.

Another object is to provide a method of remotely controlling an electrical power meter.

SUMMARY OF THE INVENTION

The invention is based on the realisation that the electromagnetic field around an electric conductor can be used to measure the power flowing through the conductor by means of sensors without any movable parts and to drive an electronic circuit. This is used together with digital communication through the electric conductor to provide for remote measuring and control of the electrical power consumed by a consumer connected to an electric power network.

According to a first aspect of the invention there is provided a method for measuring electrical power as defined in appended claim 1.

According to a second aspect there is provided an electrical power meter as defined in claim 4.

According to a third aspect there is provided a system for measuring electrical power as defined in claim 16.

The invention provides a measuring system wherein the measuring device can be installed without skilled personnel, i.e., the subscriber caters for the installation.

A method is also provided by means of which it is possible to remotely collect information regarding electrical power consumption of customers in an efficient way.

Another advantage is the possibility to remotely disconnect a subscriber by means of a circuit breaker provided in the sensing apparatus.

BRIEF DESCRIPTION OF DRAWINGS

The invention is now described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is an overview of a measuring system according  
5 to the invention,

Fig. 2 is a schematic overview of an electrical power meter used in the system shown in figure 1

Figs. 3a and 3b are cross-sectional views of a master and a slave module, respectively, incorporated in elec-  
10 trical power meter shown in figure 2, and

Fig. 4 is a schematic block diagram of the measuring apparatus shown in figure 2.

DETAILED DESCRIPTION OF THE INVENTION

In the following, a detailed description of the invention will be given. Some of the elements described herein are identical to their shape and function and are then given the same reference numeral followed by an accompanying letter. When identical elements are referred to collectively the accompanying letter can be  
15 omitted.  
20

Reference is first made to figure 1, wherein part of an electrical power network system, generally designated 10, is shown. The system shown in the figure comprises electrical three phase power lines 12 running between a  
25 connection point, such as a power station 14, and a number of electrical power consumers 16a-d.

Somewhere close to the connection point there is a host server 20 connected to the power lines 12. The host

server 20 is an ordinary computer provided with a power-net modem supporting TCP/IP. The server 20 is running administration software etc. and will be further described below.

5 At each consumer there is provided a respective electrical power meter 30a-d, an overview of which will now be given with reference to figure 2. The three-phase meter is made up of three parts shaped and configured as conventional fuses or circuit breakers. The three  
10 parts comprise two identical slave modules 50a, 50b connected to a master module 40. The tree modules are arranged to be mounted as conventional plug fuses in a fuse box with the master module 40 arranged in the centre position and the slave modules 50a, 50b arranged on  
15 either side thereof. The slave modules are connected to the master module by means of a respective strip 60a, 60b made of polyester or another fragile or brittle material. The reason for this choice of material is that it should be difficult to remove the strip once it  
20 is installed, thereby preventing fraudulent manipulation of the arrangement.

The strip 60 is permanently attached to the master module 40 and electrically connected thereto by means of a pattern (not shown) of three rather wide printed  
25 copper paths 62a-c running in parallel between the master module 40 and the slave module 50 when connected thereto. The procedure of connecting the slave modules to the master module follows the following steps. First, the master module 40 and the slave modules 50a,  
30 50b are screwed into a respective socket with the master module 40 positioned between the slave modules 50a, 50b. Special care must be taken to ensure that the

strips 60a, 60b are not damaged during this process.

The strips 60a, 60b are then inserted into a respective slot 52a, 52b arranged in the slave modules. Once inserted into the slots 52, the strips 60 can not be

5 withdrawn from the slave modules because of a one-way retaining means provided in the slot.

With the strips 60 attached, it is not possible to unscrew the modules 40, 50 because the stripes 60 would then break, destroying the arrangement by breaking the 10 electrical connection between the master module and the slave modules.

When mounted in the fuse box, the modules 40, 50 function as ordinary fuses, normally of the 10 or 16 Amps size.

15 The structure of the master module 40 will now be described with reference to figure 3a, which shows a cross-section through the centre of the master module. The module has a general outline similar to a conventional fuse, with a bottom connector 41 adapted for 20 connection to the bottom surface of the fuse socket (not shown) and thus functioning as a first connector of the module. The bottom connector 41 is electrically connected to a thread 42 by means of a conductive wire 43. The thread is shaped so as to fit with the internal 25 thread (not shown) provided in the fuse socket and thus functions as a second connector of the module. A major portion of the conductive wire 43 runs essentially parallel to the longitudinal axis of the fuse 40.

With the module 40 mounted in the socket, the wire 43 30 forms a part of the wire 12 supplying the consumer 16

with electrical power, see figure 1. Thus, all power consumed passes through the wire 43.

A coil 44 is provided around a portion of the conductive wire 43, preferably made of copper. The two ends 5 of the coil are connected to inputs of an electronic circuitry 70 provided in the fuse. By means of the coil 44, the electromagnetic field generated by current flowing in the wire 43 is detected. More specifically, the generated field in turn generates a current in the 10 coil 44, which is read and interpreted by the circuitry 70, thus generating instantaneous values of the current flowing in the wire 43. The number of turns of the coil is adapted to the expected induced field so as to give a suitable measuring value. In the preferred embodiment, the number of turns in the coil 44 is about 500, giving an input voltage of about 3 Volts to the circuitry 70. However, too many turns lead to too much 15 metal, giving an inductance that will decrease the maximum practical frequency induced in the coil.

20 As stated above, the two strips 60a, 60b are fixedly connected to the master module 40. The conductive paths 62 on the strips are connected to respective inputs of the electronic circuitry 70 of the master module 40.

An electronic trip circuit 45 is provided in serial 25 connection with the wire 43. The trip circuit 45 is controlled by the circuitry 70, which thereby can break the current path between the connectors 41 and 42.

All components included in the modules 40 and 50 are 30 preferably embedded in a mould made of a suitable polymer

In figure 3b, a slave module 50 is shown in cross-section. The slave module is similar to the master module with the exception of the electronic circuitry 70, which is omitted in the slave modules. Thus, a 5 slave module comprises a first connector 51, a second connector 52, a conductive wire 53 there between, a coil 54 and a trip circuit 55. The coil 54 and the trip circuit 55 are connected to a contact means 56 arranged to connect to the conductive paths 62 of a strip 60 inserted into the above mentioned slot 57 of the slave 10 module 50. In that way, both the coil 54 and the trip circuit 55 of a slave module are connected to the electronic circuitry 70 of the master module 40.

The electronic circuitry 70 of the master module 40 15 will now be described, partly with reference to figure 4, which is a schematic block diagram of the electronic function of the master-slave arrangement shown in figure 2. The main part of the circuitry 70 is a processor 72. This is preferably a low voltage version of the 20 type 8751 processor, operating at 2,7 Volts or lower, and provided with an internal EEPROM. The low power consumption of this device, less than 150  $\mu$ Amps, makes this circuit ideal for this kind of application.

An oscillator 74 is provided as a reference clock for 25 the circuitry 70. A preferred frequency of the oscillator is 100 kHz.

There is also provided an internal reference 76. Preferred values for this reference is 1 Volt and 1 Ohm.

Filters 78 functioning as stabilisers are also provided 30 between the coil 44 and processor 72.

Finally, there is provided a capacitor 80 with a preferred value of 40  $\mu$ F. The function of this component will be described below.

The function of the measuring system will now be described. As already mentioned, the currents in the wires 12 leading to the consumers 16, see figure 1, are detected by means of the coils 44, 54a, 54b provided in the modules 40, 50a, and 50b, respectively. The measuring values are directed to inputs of the microprocessor 72. The actual currents flowing to the consumer 16 is there derived from the measured values by means of mathematical functions known to the person skilled in the art. Samples of measured values are taken with a frequency of 1000 Hz, i.e., 1000 samples are taken per second. The samples comprise both current and voltage values. This is necessary as the current and voltage in a power line are mutually displaced. Due to this, in order to get a correct power measurement, both current and voltage values are required.

Superposed on the basic electric power frequency in the lines 12, normally 50 or 60 Hz, is a Frequency Shift Keying (FSK) signal on a certain undefined frequency band. This FSK signal is used for communication via one of the power lines 12 between the server 20 and the different electrical power meters 30. In the preferred embodiment, this communication uses the TCP/IP protocol. This protocol is suitable for this kind of application, wherein it sometimes is necessary to retransmit a message several times before it is received successfully.

Each electrical power meter 30, i.e., master module 40, has its own IP address. In the microprocessor 72, there is a software application listening for messages intended for this particular address. Thus, the FSK signal is extracted from the current induced in the coil 44 by means of the filter 78 and is interpreted and if the address given in the header of the message is correct, the rest of the message is also interpreted.

5 Simultaneously, measuring values are taken and stored

10 in the memory 73.

Two different types of measuring values are stored: an instantaneous value stored as a 16-bit value and a cumulative value stored as a 64-bit value. The cumulative value is effectively an odometer keeping track of

15 the total consumed power. This value can be used for billing purposes, as will be described below.

The communication between the server 20 and the master modules 40 follows any suitable command structure adapted to this application. Thus, there are commands

20 for the various tasks for the master modules 40. An example thereof is the GET\_ACCOUNT command. The server 20 sends this command together with an IP address for the electrical power meter 30 to be read. When the meter 30 in question reads the command, it retrieves

25 the cumulative value from the memory 73 and sends it together with its IP address onto the power lines 12. This message is then read by the server, which uses the value as a basis for billing.

The master module 40 is also used for transmitting data

30 to the server 20. However, the energy received from the power supply is not sufficient for superposing a FSK

signal on the lines 12. Therefore, the capacitor 80 is provided for storing the energy needed for transmitting the FSK signal. In the preferred embodiment, the capacitor has a value of about 40  $\mu$ F, giving a voltage of 5 10 Volts for 400  $\mu$ s. Thus, the microprocessor 72 buffers the message in a high voltage buffer and then transmits the signal.

An application implemented in the master module 40 is the remote trip function. In the case a particular consumer is to be excluded from the power network, e.g. due to failing to pay an earlier invoice, the fuses of the electrical power meter 30 can be tripped from the server 20. This is carried out in the following way. A message is sent to the master module 40 belonging to 15 the electrical power meter 30 to be tripped, telling it to open the trip circuits 45. The electronic circuitry then issues a command to the trip circuits 45, 55a, 55b to open, thereby cutting the current path through the modules.

20 In case the connection between the master module 40 and at least one of the slave modules is broken, this is detected by the microprocessor 70 because there is no current flowing through the loop comprising the slave coils 54. In that case, a message is sent to the server 25 20, telling that the electrical power meter has failed.

It is also possible to calibrate the master module 40 by means of a predetermined FSK pattern superposed on the normal current of the wires 12. As an example, a signal comprising solely "1":s is transmitted from the 30 server 20. This signal represents a certain current level, which is then detected and interpreted by the

master module 40. By means of this detected current shift, the module 40 can then be self-calibrated. Thus, a signal having a predetermined level is input and the output level is determined. The module then calibrates 5 until the output level is equal to the input level. With the described system, billing of the customers is effected in the following way. The server 20 collects and compiles the odometer readings from the meters 30. A software application then connects a number of measurements from a certain devices to a predefined tariff 10 and adds information of the account customer 16. This gives the full information to create a record and, hence, a bill to be sent to the customer in any convenient way, such a through the Internet or by ordinary 15 mail.

As the invoice contains all information about the customer and the content of the invoice to be paid, in an electronic format, it is very well suited to be sent directly to a billing service. The billing service lets 20 the customer view the account and the bill over the Internet and also lets him/her select a convenient way to settle it.

The billing and payment service may let the customer get access to the status of the bill and the ways to 25 pay it over the Internet, possibly by means of a so-called Set Top Box (STB). With a STB or other device provided with a smartcard interface, it is possible to view the reception and the status of the electricity consumption on the display of a SWATSCard®. This complete package will make the need for any mailings to 30 the customer obsolete. It also gives the provider of

electrical power the possibility to have a diversified tariff, for example on a daily or hourly basis.

A preferred embodiment of the invention has been described. However, the person skilled in the art realises that this can be varied within the scope of the appended claims without departing from the inventive idea. Thus, an electrical three-phase system has been shown. It is realised that the invention is applicable to single phase systems as well, in which case the slave modules are omitted.

Furthermore, the connection between master and slave modules has been shown in the form of strips fixedly attached to the master module. However, any kind of connecting means is possible as long as it is impossible to remove it once attached. Thus, in an alternative embodiment, the strips 60 are separate parts, being inserted into a slot in both the master and the slave module to be interconnected. Alternatively, the strips 60 are fixedly attached to the slave modules instead.

Although frequency shift keying has been described as the preferred communication method, other communication methods are also possible, such as Phase Shift Keying (PSK).

The electrical power meter has been described as having no display. From a technical point of view, this is entirely feasible. However, in order to comply with regulations and also for the sake of convenience, the master module 40 may comprise a display means, such as a LCD, on which stored current values are displayed.

Although current has been described above as the measured quantity, also voltage is measured in order to calculate the electrical power.

The coils 44, 54 have been described as connected by 5 their respective end portions to the circuitry 70. However, also a portion essentially at the middle of the coils can be connected to the circuitry 70. In that way, more signals are obtained for subsequent interpretation.

## CLAIMS

1. A method of measuring electrical power conducted through at least one electrical conductor (12,43;53), comprising the following steps:
  - sensing an electromagnetic field around said at least one electrical conductor (12,43;53) at a measuring position, and
  - 10 - deriving the current flowing through said at least one electrical conductor from said sensed electromagnetic field,
- characterised by
  - storing instantaneous values for said current in an electronic memory means (73) powered by said electromagnetic field, and
  - 15 - transmitting said instantaneous values or values derived from said instantaneous values as digital information on said at least one electrical conductor (12,43;53) to a transceiver (20) provided at a distance from said measuring position.
2. A method according to claim 1, wherein said transmitting is effected by means of Frequency Shift Keying.
- 25 3. A method according to claim 1 or 2, wherein said sensing is effected by means of an electrically conductive coil arranged around said at least one electrical conductor (12,43;53).

4. An electrical power meter connectable to at least one electrical conductor (12), said power meter comprising:

- means (44,54) for sensing an electromagnetic field around said at least one electrical conductor (12),
- means (72) for deriving the current flowing through said at least one electrical conductor from said sensed electromagnetic field,

**characterised by**

- 10 - means (72,73) for storing instantaneous values for said current, wherein said means for storing are powered by said electromagnetic field, and
- means (44, 72, 78, 80) for transmitting said instantaneous values or values derived from said instantaneous values as digital information on said at least one electrical conductor to a transceiver (20) provided at a distance from said measuring position.

5. A meter according to claim 4, comprising:

- 20 - at least one first connector (41;51) connectable to said at least one electrical conductor (12),
- at least one second connector (42;52) connectable to an electric load (16), and
- a switch (45;55) arranged to interconnect said at least one first and second connectors in normal operation and, when commanded, to disconnect said at least one first connector from said at least one second connector.

6. A meter according to claim 5, wherein said switch means is commanded by a processor (72).

7. A meter according to claim 6, wherein said processor (72) is commanded by said transceiver (20) 5 via said at least one electrical conductor (12).

8. A meter according to any of claims 4-7, comprising at least one module (40,50) arranged to be installed as a fuse.

9. A meter according to any of claims 4-8, wherein 10 said meter is arranged for measuring three-phase power, comprising:

- a first module (40) including:

- a first connector (41) connectable to said at least one electrical conductor (12), and

15 - a second connector (42) connectable to an electric load (16) and to said first connector (41), and

- two second modules (50a,50b), each of said second modules including:

20 - a first connector (51a;51b) connectable to said at least one electrical conductor (12), and

- a second connector (52a;52b) connectable to an electric load (16) and to said first connector (51a;51b),

25 - wherein each of said second modules (50a,50b) is electrically connectable to said first module (40) by means of an interconnecting means (60a;60b)

arranged to be permanently attached to said first and second modules.

10. A meter according to claim 9, wherein said interconnecting means comprises a strip (60a,60b) made of fragile material, preferably polyester, said strip having a layer of electrically conducting paths thereon.

11. A meter according to claim 9 or 10, wherein said interconnecting means (60a,60b) are inserted into slots (57a,57b) when permanently attached.

12. A meter according to any of claims 4-11, wherein said means for transmitting said instantaneous values or values derived from said instantaneous values comprises:

15 - a processor (72), and

- a coil (44;54) arranged around said at least one electrical conductor (12,43;53), the ends of said coil being connected to said processor,
- wherein an electric current commanded by said processor is induced in said coil, resulting in a corresponding induced current in said electrical conductor, by which induced current digital information is transferred via said electrical conductor.

20 13. A meter according to claim 12, wherein the number of turns of said coil (44;54) is about 500.

14. A meter according to any of claims 4-13, wherein said digital information is transmitted by means of frequency shift keying (FSK).

15. A meter according to any of claims 4-14, wherein the current flowing through said at least one electrical conductor is measured at a rate of 1000 samples per second.

5 16. A system for measuring electrical power, comprising:

- an electrical power network (12),
- a computer (20) connected to said power network,

**c h a r a c t e r i s e d b y**

10 - an electrical power meter (30) according to any of claims 4-15 connected to said electrical power network.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



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(21) International Application Number: PCT/SE00/01843

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(71) Applicant (for all designated States except US): APPLIED POLYTECHNICS INC. [SE/SE]; Timmervägen 43, S-118 55 Stockholm (SE).

(72) Inventor; and

(75) Inventor/Applicant (for US only): ASPLUND, Johan [SE/SE]; Timmervägen 43, S-118 55 Stockholm (SE).

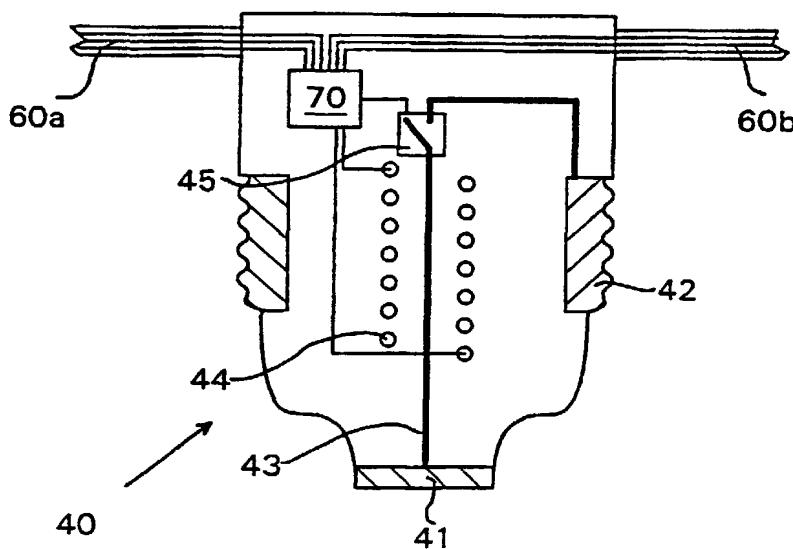
(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD, SYSTEM AND APPARATUS FOR REMOTE MEASURING OF ELECTRICAL POWER



(57) Abstract: A method of measuring electrical power to consumers (16a-d) in a power distribution network (12) is described. The method comprises sensing an electromagnetic field around at least one electrical conductor (12) in a power meter (30a-d) located at a consumer. The current flowing through the conductor is then derived from said sensed electromagnetic field. Instantaneous current values are stored in an electronic memory powered by said electromagnetic field. These instantaneous values or values derived from the instantaneous values are transmitted as digital information on the network to a receiver (20) provided at a distance from the power meter.

WO 01/22102 A1

1/3

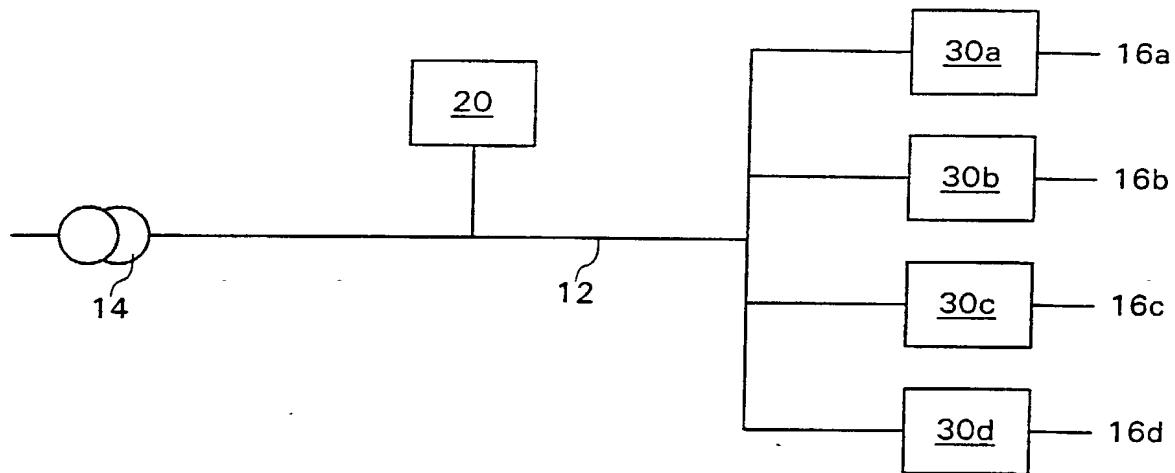
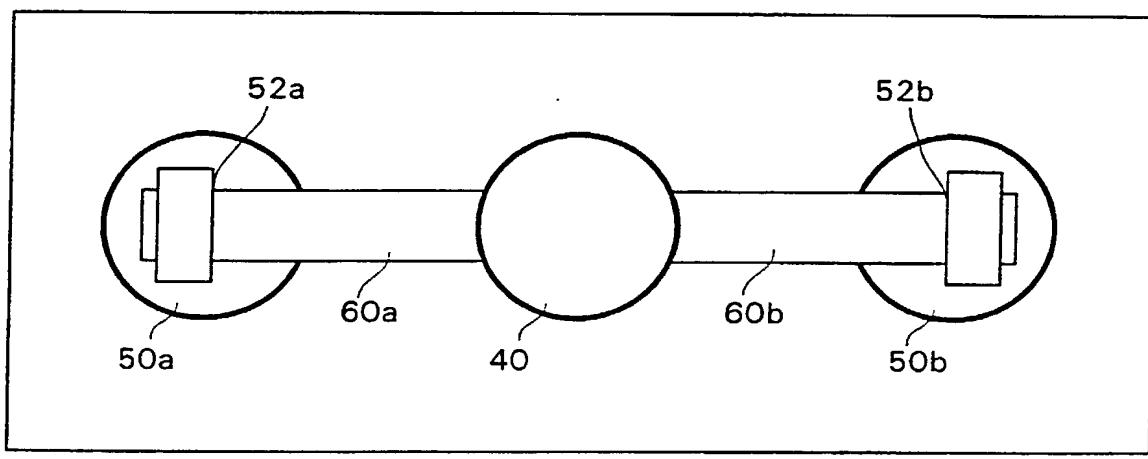


Fig. 1



30

Fig. 2

2/3

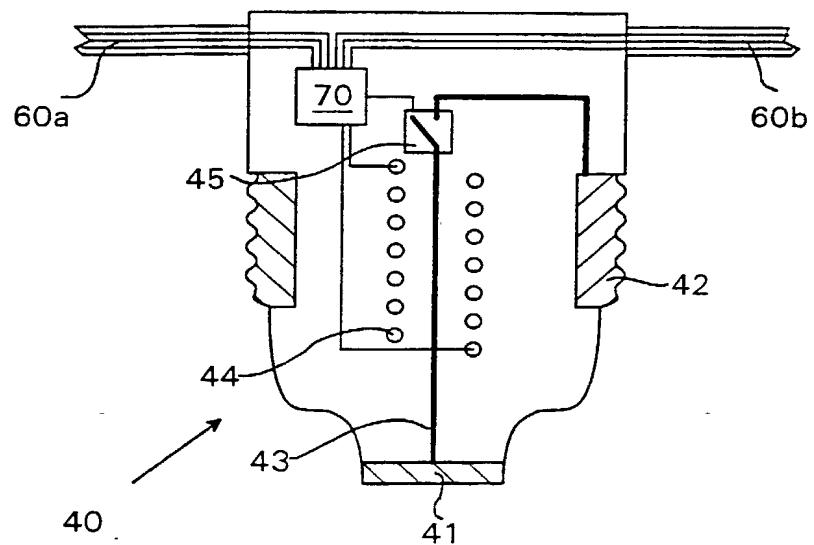


Fig. 3a

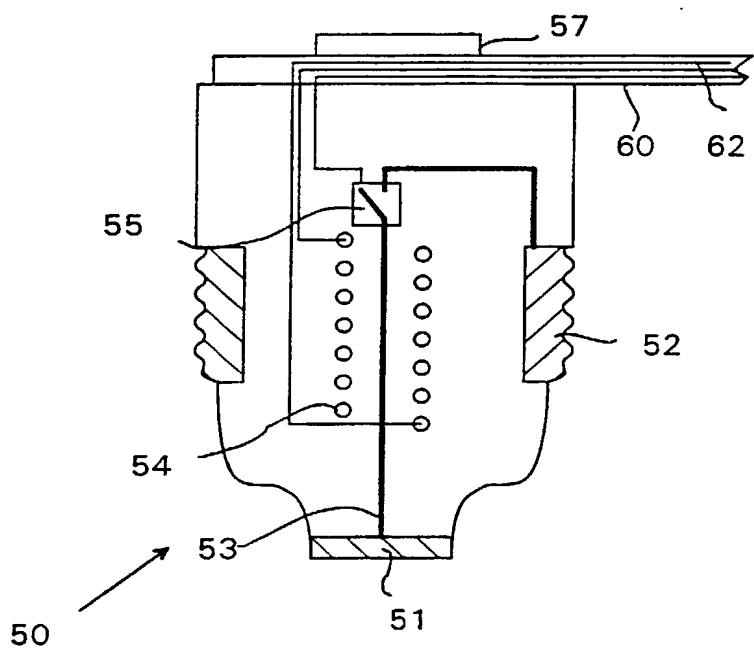


Fig. 3b

3/3

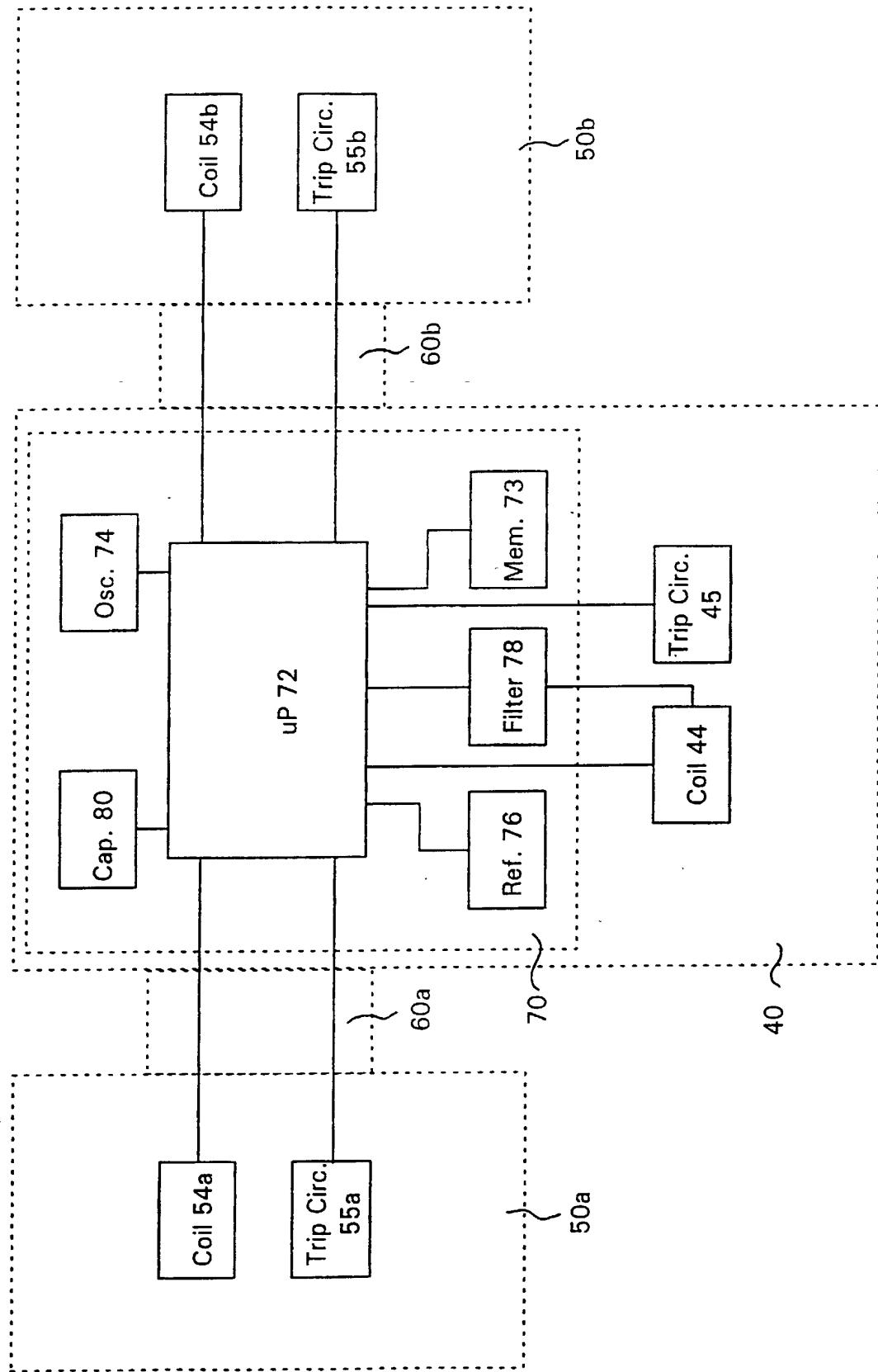


Fig. 4

**ALL FOREIGN APPLICATION(S), IF ANY, FILED MORE THAN 12 MONTHS  
(6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION**

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**NOTE:** If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. § 120.

**POWER OF ATTORNEY**

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

*(list name and registration number)*

*(check the following item, if applicable)*

- I hereby appoint the practitioner(s) associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.
- Attached, as part of this declaration and power of attorney, is the authorization of the above-named practitioner(s) to accept and follow instructions from my representative(s).

**NOTE:** "Special care should be taken in continuation or divisional applications to ensure that any change of correspondence address in a prior application is reflected in the continuation or divisional application. For example, where a copy of the oath or declaration from the prior application is submitted for a continuation or divisional application filed under 37 CFR 1.53(b) and the copy of the oath or declaration from the prior application designates an old correspondence address, the Office may not recognize, in the continuation or divisional application, the change of correspondence address made during the prosecution of the prior application. Applicant is required to identify the change of correspondence address in the continuation or divisional application to ensure that communications from the Office are mailed to the current correspondence address. 37 CFR 1.63(d)(4)." § 601.03, M.P.E.P., 7th Edition.

SEND CORRESPONDENCE TO  
K. Bradford Adolphson

Address  
Ware, Fressola, Van der Sluys &  
Adolphson LLP  
755 Main Street, P.O. Box 224  
Monroe, CT 06468

Customer Number 004955

DIRECT TELEPHONE CALLS TO:  
(Name and telephone number)

K. Bradford Adolphson  
(203) 261-1234

*(complete the following if applicable)*

Since this filing is a  continuation  divisional there is attached hereto a Change of Correspondence Address so that there will be no question as to where the PTO should direct all correspondence.

**PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS  
(6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION  
AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119(a)-(d)**

COUNTRY (OR INDICATE IF PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119
Sweden	9903447-2	23 Sept. 1999	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/>
Sweden	0000913-4	20 March 2000	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/>
			<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/>
			<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/>
			<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/>

**CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S)**  
(34 U.S.C. § 119(e))

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

**PROVISIONAL APPLICATION NUMBER**

**FILING DATE**

\_\_\_\_\_ / \_\_\_\_\_  
\_\_\_\_\_ / \_\_\_\_\_  
\_\_\_\_\_ / \_\_\_\_\_

\_\_\_\_\_ / \_\_\_\_\_  
\_\_\_\_\_ / \_\_\_\_\_  
\_\_\_\_\_ / \_\_\_\_\_

**CLAIM FOR BENEFIT OF EARLIER US/PCT APPLICATION(S)  
UNDER 35 U.S.C. § 120**

The claim for the benefit of any such applications are set forth in the attached ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN-PART (C-I-P) APPLICATION.

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**COMBINED DECLARATION AND POWER OF ATTORNEY**

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL,  
CONTINUATION, OR C-I-P)

---

As a below named inventor, I hereby declare that:

**TYPE OF DECLARATION**

This declaration is of the following type:

*(check one applicable item below)*

original.  
 design.

**NOTE:** *With the exception of a supplemental oath or declaration submitted in a reissue, a supplemental oath or declaration is not treated as an amendment under 37 CFR 1.312 (Amendments after allowance). M.P.E.P. § 714.16, 7th Edition.*

supplemental.

**NOTE:** *If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application, do not check next item; check appropriate one of last three items.*

national stage of PCT.

**NOTE:** *If one of the following 3 items apply, then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR C-I-P.*

**NOTE:** *See 37 C.F.R. § 1.63(d) (continued prosecution application) for use of a prior nonprovisional application declaration in the continuation or divisional application being filed on behalf of the same or fewer of the inventors named in the prior application.*

divisional.  
 continuation.

**NOTE:** *Where an application discloses and claims subject matter not disclosed in the prior application, or a continuation or divisional application names an inventor not named in the prior application, a continuation-in-part application must be filed under 37 C.F.R. § 1.53(b) (application filing requirements — nonprovisional application).*

continuation-in-part (C-I-P).

**INVENTORSHIP IDENTIFICATION**

**WARNING:** *If the inventors are each not the inventors of all the claims, an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.*

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor (*if only one name is listed below*) or an original, first and joint inventor (*if plural names are listed below*) of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

**TITLE OF INVENTION**

METHOD, SYSTEM AND APPARATUS FOR REMOTE MEASURING OF ELECTRICAL POWER

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(Declaration and Power of Attorney [1-1]—page 1 of 7)

Express Mail No.

EV005528063US

**SPECIFICATION IDENTIFICATION**

the specification of which:

(complete (a), (b), or (c))

(a)  is attached hereto.

NOTE: "The following combinations of information supplied in an oath or declaration filed on the application filing date with a specification are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 CFR 1.63:

"(1) name of inventor(s), and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration on filing;

"(2) name of inventor(s), and attorney docket number which was on the specification as filed; or

"(3) name of inventor(s), and title which was on the specification as filed."

Notice of July 13, 1995 (1177 O.G. 60).

(b)  was filed on \_\_\_\_\_, as  Serial No. 0 / \_\_\_\_\_ or  \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

NOTE: Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 C.F.R. § 1.67.

NOTE: "The following combinations of information supplied in an oath or declaration filed after the filing date are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 CFR 1.63:

"(A) application number (consisting of the series code and the serial number, e.g., 08/123,456);

"(B) serial number and filing date;

"(C) attorney docket number which was on the specification as filed;

"(D) title which was on the specification as filed and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration; or

"(E) title which was on the specification as filed and accompanied by a cover letter accurately identifying the application for which it was intended by either the application number (consisting of the series code and the serial number, e.g., 08/123,456), or serial number and filing date. Absent any statement(s) to the contrary, it will be presumed that the application filed in the PTO is the application which the inventor(s) executed by signing the oath or declaration."

M.P.E.P. § 601.01(a), 7th Ed.

(c)  was described and claimed in PCT International Application No. PCT/SE00/01843, filed on Sept. 22, 2000 and as amended under PCT Article 19 on \_\_\_\_\_ (if any).

**SUPPLEMENTAL DECLARATION (37 C.F.R. § 1.67(b))**

*(complete the following where a supplemental declaration is being submitted)*

I hereby declare that the subject matter of the  
 attached amendment  
 amendment filed on \_\_\_\_\_

was part of my/our invention and was invented before the filing date of the original application, above-identified, for such invention.

**ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR**

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56,

*(also check the following items, if desired)*

and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and  
 in compliance with this duty, there is attached an information disclosure statement, in accordance with 37 C.F.R. § 1.98.

**PRIORITY CLAIM (35 U.S.C. §§ 119(a)–(d))**

**NOTE:** "The claim to priority need be in no special form and may be made by the attorney or agent if the foreign application is referred to in the oath or declaration as required by § 1.63. The claim for priority and the certified copy of the foreign application specified in 35 U.S.C. 119(b) must be filed in the case of an interference (§ 1.630), when necessary to overcome the date of a reference relied upon by the examiner, when specifically required by the examiner, and in all other situations, before the patent is granted. If the claim for priority or the certified copy of the foreign application is filed after the date the issue fee is paid, it must be accompanied by a petition requesting entry and by the fee set forth in § 1.17(i). If the certified copy is not in the English language, a translation need not be filed except in the case of interference; or when necessary to overcome the date of a reference relied upon by the examiner; or when specifically required by the examiner, in which event an English language translation must be filed together with a statement that the translation of the certified copy is accurate." 37 C.F.R. § 1.55(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §§ 119(a)–(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

*(complete (d) or (e))*

(d)  no such applications have been filed.  
(e)  such applications have been filed as follows.

**NOTE:** Where item (c) is entered above and the International Application which designated the U.S. itself claimed priority check item (e), enter the details below and make the priority claim.

**DECLARATION**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**SIGNATURE(S)**

**NOTE:** Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other documents.

**NOTE:** Each inventor must be identified by full name, including the family name, and at least one given name without abbreviation together with any other given name or initial, and by his/her residence, post office address and country of citizenship. 37 CFR § 1.63(a)(3).

**NOTE:** Inventors may execute separate declarations/oaths provided each declaration/oath sets forth all the inventors. Section 1.63(a)(3) requires that a declaration/oath, *inter alia*, identify each inventor and prohibits the execution of separate declarations/oaths which each sets forth only the name of the executing inventor. 62 Fed. Reg. 53,131, 53,142, October 10, 1997.

**Full name of sole or first inventor**

Johan F.C. Asplund  
 (GIVEN NAME) (MIDDLE INITIAL OR NAME) FAMILY (OR LAST NAME)  
 Inventor's signature Johan Asplund  
 Date 4/24/02 Country of Citizenship Sweden  
 Residence Stockholm, Sweden Sex S  
 Post Office Address Timmermansgatan 43  
Stockholm, Sweden S-118 55

**Full name of second joint inventor, if any**

(GIVEN NAME) (MIDDLE INITIAL OR NAME) FAMILY (OR LAST NAME)  
 Inventor's signature \_\_\_\_\_  
 Date \_\_\_\_\_ Country of Citizenship \_\_\_\_\_  
 Residence \_\_\_\_\_  
 Post Office Address \_\_\_\_\_

**Full name of third joint inventor, if any**

(GIVEN NAME) (MIDDLE INITIAL OR NAME) FAMILY (OR LAST NAME)  
 Inventor's signature \_\_\_\_\_  
 Date \_\_\_\_\_ Country of Citizenship \_\_\_\_\_  
 Residence \_\_\_\_\_  
 Post Office Address \_\_\_\_\_

*(check proper box(es) for any of the following added page(s)  
that form a part of this declaration)*

**Signature** for fourth and subsequent joint inventors. *Number of pages added* \_\_\_\_\_

\* \* \*

**Signature** by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. *Number of pages added* \_\_\_\_\_

\* \* \*

**Signature** for inventor who refuses to sign or cannot be reached by person authorized under 37 CFR 1.47. *Number of pages added* \_\_\_\_\_

\* \* \*

Added page for **signature** by one joint inventor on behalf of deceased inventor(s) where legal representative cannot be appointed in time. (37 CFR 1.47)

\* \* \*

Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (C-I-P) application.

*Number of pages added* \_\_\_\_\_

\* \* \*

Authorization of practitioner(s) to accept and follow instructions from representative.

\* \* \*

*(if no further pages form a part of this Declaration,  
then end this Declaration with this page and check the following item)*

This declaration ends with this page.

**(Declaration and Power of Attorney [1-1]—page 7 of 7)**

Practitioner's Docket No. 543-001-2**PATENT****ADDED PAGE TO COMBINED DECLARATION AND POWER OF  
ATTORNEY FOR AUTHORIZATION OF ATTORNEY(S) TO ACCEPT AND  
FOLLOW INSTRUCTIONS FROM REPRESENTATIVE**

The undersigned to this declaration and power of practitioner hereby authorizes the U.S. practitioner(s) named herein to accept and follow instructions from

Kransell & Wennborg ABName(s) of authorized representative(s)Box 27834AddressStockholm, Sweden S-115 93

as to any actions to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. practitioner(s) and the undersigned. In the event of a change in the person(s) from whom instructions may be taken, the U.S. practitioner(s) will be so notified by the undersigned.

(Added Page to Combined Declaration and Power of Attorney for Authorization of Attorney(s) to Accept and Follow Instructions from Representative [1-24])

10/088810

Rec'd PCT/PTO 09 MAY 2002  
PATENT

Practitioner's Docket No. 543-001-2

Applicant Johan Asplund  Pattee \_\_\_\_\_  
 Application No.  Patent No. \_\_\_\_\_  
 Filed on March 20, 2002  Issued on \_\_\_\_\_  
Title: METHOD, SYSTEM AND APPARATUS FOR REMOTE MEASURING OF ELECTRICAL POWER

**STATEMENT CLAIMING SMALL ENTITY STATUS  
(37 CFR 1.9(f) and 1.27(c))—SMALL BUSINESS CONCERN**

I hereby state that I am

the owner of the small business concern identified below:  
 an official of the small business concern empowered to act on behalf of the concern identified below:

Name of Small Business Concern Applied Polytechnics Inc.

Address of Small Business Concern Timmermansgatan 43  
Stockholm, Sweden S-118 55

I hereby state that the above identified small business concern qualifies as a small business concern, as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office under Sections 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby state that rights under contract or law have been conveyed to, and remain with, the small business concern identified above, with regard to the invention described in

the specification filed herewith, with title as listed above.  
 the application identified above.  
 the patent identified above.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights in the invention is listed below\* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c), if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

\*NOTE: Separate statements are required from each named person, concern or organization having rights to the invention as to their status as small entities. (37 CFR 1.27)

(Small Entity-Small Business [7-4]—page 1 of 2)

Express Mail No. EV005528063US

Each such person, concern or organization having any rights in the invention is listed below:

No such person, concern, or organization exists.  
 Each such person, concern or organization is listed below.

Name \_\_\_\_\_

Address \_\_\_\_\_

INDIVIDUAL       SMALL BUSINESS CONCERN       NONPROFIT ORGANIZATION

Name \_\_\_\_\_

Address \_\_\_\_\_

INDIVIDUAL       SMALL BUSINESS CONCERN       NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 CFR 1.28(b))

*(check the following item, if desired)*

NOTE: The following verification statement need not be made in accordance with the rules published on Oct. 10, 1997, 62 Fed. Reg. 52,131, effective Dec. 1, 1997.

NOTE: "The presentation to the Office (whether by signing, filing, submitting, or later advocating) of any paper by a party, whether a practitioner or non-practitioner, constitutes a certification under § 10.18(b) of this chapter. Violations of § 10.18(b)(2) of this chapter by a party, whether a practitioner or non-practitioner, may result in the imposition of sanctions under § 10.18(c) of this chapter. Any practitioner violating § 10.18(b) may also be subject to disciplinary action. See §§ 10.18(d) and 10.23(c)(15)." 37 C.F.R. § 1.4(d)(2).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name of Person Signing JOHAN ASPLUND

Title of Person if Other Than Owner PRESIDENT

Address of Person Signing Timmermansgatan 43

Stockholm, Sweden S-118 55

SIGNATURE

Date

04/24/02

(Small Entity—Small Business [7-4]—page 2 of 2)